SUBJECT: INSTRUMENT OPERATION:

Casella Model CEL-254

Digital Impulse Sound Level Meter

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1.0 Purpose/Scope

This procedure provides a standardized method for the operation of the Casella Model CEL-254 Digital Impulse Sound Level Meter (SLM). It should be used in conjunction with the SBMS Subject Area Noise & Hearing Conservation and IH SOP IH96200 *Noise Measurement Principles: Area Surveys.*

The Casella SLM provides a method for easy and accurate surveys of workplace noise exposures. This area survey meter should be used to determine the baseline noise levels and area noise levels. Its use is designed for conducting noise surveys to determine the need for posting area warning, locating problem-noise sources, and measuring the effectiveness of engineering controls.

The Casella SLM can be used as a screening tool to determine the need for personal monitoring and to sketch isometric lines for control area delineation. Generally, employee exposure assessments should be made with a noise dosimeter. However, this area survey meter can be used in limited situations for exposure assessments, such as for operations that are of short duration and involve limited employee movement. This allows the meter to

measure the actual employee exposure. In these cases, the meter reading must be observed over the entire time of exposure.

2.0 Responsibilities

2.1 Use of the Casella SLM shall be limited to persons who act under the direction of a competent hazard assessment person and have demonstrated the competency to satisfactorily use the meter, as evidenced by experience and training, to the satisfaction of their supervision or existing qualification criteria set by their organization. See Section 7 for qualification requirements.

2.2 Personnel that perform exposure monitoring with this instrument are responsible to follow all steps in this procedure.

2.3 The data collected using this meter must have an appropriate evaluation of the hazard and risk by a cognizant Industrial Hygiene professional.

3.0 Definitions

3.1 *Decibel (dB):* A non-dimensional unit used to express sound pressure levels. It is the log of the ratio of the measured sound pressure level to a reference level.

3.1.1 *dBA:* A sound pressure level in decibels made on the A-scale of a sound level meter. This unit of measure approximates the response of the human ear.

3.1.2 *dBC:* Sound pressure based on a nearly flat scale.

3.2 *Frequency:* The number of cycles completed by a periodic quantity in time. Unit, hertz (Hz) measures cycles per second; perceived as the "pitch" of the sound.

3.3 *Sound Pressure Level (SPL):* the quantity measured with a sound level meter; the intensity or perceived "loudness" of the sound.

3.4 *Impulse or Impact Noise Levels:* Variations in noise levels that involve peak levels spaced at periods of greater than one per second. Where the intervals are less than one second, it should be considered a continuous noise source.

3.5 *Occupational Exposure Limit:* The maximum time weighted average (TWA) exposure permitted for an employee, based on the lesser of the OSHA Permissible Exposure Limit (PEL: 90 dBA) or ACGIH Threshold Limit Value (TLV: 85 dBA). Also used for determining necessary actions by the employer is the OSHA Action Level of 85 dBA. See IH96200.

4.0 Prerequisites

4.1 **Training prior to using this meter:**

4.1.1 Demonstration of proper operation of the instrument to the satisfaction of the employee's supervision. See Section 7 for qualification requirements.

4.1.2 Other appropriate training for the area to be entered (check with ESH coordinator or FS Representative for the facility).

4.1.3 Noise and Hearing Conservation Training and a Baseline audiogram are needed if exposure to the person performing the survey will be in excess of the OSHA Action Level (85 dBA). See IH96200.

4.2 **Area Access**:

4.2.1 Contact the appropriate Facility Support Representative or Technician to obtain approval to enter radiological areas.

4.2.2 Verify with the appropriate Facility Support Representative or Technician if a Work Permit or Radiological Work Permit is needed or is in effect. If so, review and sign the permit.

4.2.3 Use appropriate PPE for area or wear hearing protection when levels are unknown.

5.0 Precautions

5.1 Hazard Determination:

5.1.1 The operation of this meter does not cause exposure to any chemical, physical, or radiological hazards. The meter design does not cause significant ergonomic concerns in routine use. The meter does not generate Hazardous Waste.

5.1.2 By its very nature, the Casella SLM may be used in areas where excessive noise levels exist or are suspected to be present. Exposures to noise levels above the PEL, TLV or Action Level may cause temporary or permanent hearing loss.

5.2 Personal Protective Equipment:

5.2.1 In areas where noise levels exceed, or are expected to exceed, the *Occupational Exposure Limit (OEL)*, hearing protection should be worn. The hearing

protection should be able to reduce the noise levels below the OEL. See IH96200 for guidance on PPE selection.

5.2.2 Additional PPE: Other appropriate PPE for the area being entered. Check with your ES&H Coordinator or Facility Support representative.

6.0 Procedure

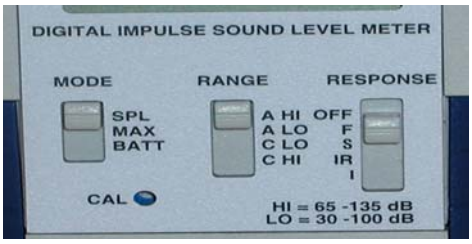
6.1 **Equipment:**

- Calibrator (Type CEL-282)
- Meter Body
- Microphone
- Batteries (4 AAA alkaline)
- Windscreen (foam ball cover for microphone)

6.2 **Operation of the Casella SLM** (picture of meter, calibrator and description of controls and displays is contained in Appendix 9.1.)

6.2.1 **Turning Power On:** Slide the ***RESPONSE*** switch from ***Off*** to ***F*** (Fast) for the calibration check.

6.2.2 **Battery Check**: If power is low, LO BAT is indicated on the display. Change the batteries.



6.2.3 **Warm-up:** A warm-up is not required for this meter.

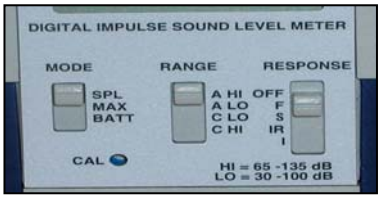
6.2.4 **Calibration:**

- Remove the microphone cover. (Translucent plastic sleeve over the metal probe.)
- Insert the CEL-254 (SLM) microphone into the coupler in the CEL-282 (calibrator) with the calibrator label facing upward.
- Slide the ***RANGE*** switch to ***A HI*** (dBA weighted, high range).
- Slide the ***RESPONSE*** switch to ***F*** **(fast)** to switch the instrument on.
- On the CEL-254 slide the ***MODE*** switch to ***SPL*** (sound pressure level) for normal noise measurements (1000Hz).

- Move the switch on the Calibrator to the ***On*** position.
- If necessary, carefully adjust the **CAL** control on the CEL-254 with the screwdriver provided until the indication is correct (113.6 dB +/- 0.1dB).
- Turn off the calibrator and remove the microphone from the calibrator.
- Record results on the sample form.

6.2.5 **Operation: Setting up the meter response:** After calibration, the meter will be ready to take measurements as a sound pressure level meter.

- Use the ***RANGE*** sliding switch to select the frequency weighting parameter between dBA and dBC.
  - ***A HI*** is normally used. Readings should begin on this setting. (Display Range 65 to 135 dB, linear range 65-121 dB).
  - ***A LO*** is used when levels are below 80 dBA. (Display Range 30 to 100 dB, linear range 30 -86dB). If OVERLOAD is display, switch to the higher range.
  - Use the ***C LO*** or ***C HI*** when measuring machinery for engineering control design.



- Use the ***RESPONSE*** sliding switch to select the response time.
  - ***S*** (slow) is normally selected. It is used for slowly varying noise.
  - ***F*** (fast) is used for comparatively stable noise.
  - ***I*** (Impulse) is used for rapidly varying noise sources.
  - ***IR*** (Impulse reset) to clear the display for the next noise measurement.

- Use the ***MODE*** sliding switch to select ***SPL*** or ***MAX*** modes.
  - ***MAX*** holds and displays the maximum reading. The reading is not stored so returning to ***SPL*** mode erases the previous Max level.
  - ***SPL*** displays the current reading and changes at a rate determined by the RESPONSE setting.

6.2.6 **Operator Position:** Hold the instrument and **point the microphone directly at the suspected noise source.** Record readings as necessary.
NOTE: There is no data logging feature with this meter.

- Preferably the operator should be further from the sound source than the

microphone and positioned as to reduce reflection of the sound to the meter. Hold the meter at arms length.

- DO NOT stand between the sound source and microphone.
- DO NOT place your hand within 12 cm (5 inches) of the microphone.
- Take measurements at ear level of employee (sitting, standing or bending) to estimate personal exposures. Take measurements at various locations around the noise source to locate isometric lines of noise intensity on a sketch for defining area levels. Include, at a minimum: immediately adjacent to the source; any area with potential worker exposure; and to delineate the 85 dBA boundary.
- For maximum confidence in the exposure assessment, also take readings near the source and in areas that have low noise levels (background) to verify that the meter response matches these higher and lower sound pressure levels.

6.2.7 **Recording readings:**

6.2.7.1 Use the BNL Direct Reading Sampling Instrument Form to record readings (see the IH web page for the most recent version: IH96200 *Noise Measurement Principles: Area Surveys.* Record SPL readings at key points such as ear level of employee (sitting, standing or bending), immediately adjacent to the source, any area with potential worker exposure, at the 85 dBA boundary, and in an area that has low noise levels (background).

6.2.7.2 Create a plot of the noise level on a map of the room/area. Record measurements around the noise source to locate isometric lines of noise intensity. Indicate the noise level: at the source, any area with potential worker exposure, and the 85 dBA boundary.

6.2.8 **End of Monitoring:**

- Perform a post calibration as per step 6.2.4. Record on form.
- Return meter and original sampling form to the SHSD IH Laboratory daily or at the end of each project as agreed to by the IH Laboratory Technician.
- Send a copy of any hazard evaluation report written on the survey to the IH Laboratory and the Occupational Medicine Clinic.

7.0 Implementation and Training

Prior to using this meter, the operator of the sound pressure level meter:

7.1 Demonstrate proper operation of this instrument to the satisfaction of the employee's supervision. SHSD personnel are to be qualified using:
Attachment 9.2 Noise Hazard Assessor Qualification HP-IHP-96120 of *IH96120 N&HC Program: SHSD Industrial Hygiene Group Role.*

7.2 Other appropriate training for the area to be entered (check with ESH coordinator or FS representative for the facility).

7.3 BNL noise and Hearing Conservation OT&Q Training and a Baseline audiogram may be needed if the duration of exposure to the person performing the survey will be in excess of the OSHA Action Level. See IH96300.

7.3.1 Threshold Limit Value (TLV) (which ever is less). See IH96200.

7.4 For the SHSD IH Group personnel:

7.4.1 Qualification on this JPM is required on a 3 year basis, providing the professional is monitoring noise sources frequently.

7.4.2 Personnel are to document their training using the Attachment 9.4 with its *Job Performance Measure Completion Certificate* for this meter.

7.4.3 This qualification is used in conjunction with the *Job Performance Measure Completion Certificate: IH Group Member NHC Hazard Assessor* from IH96120.

8.0 References

8.1 Casella Digital Sound Survey Meter Instructions.

8.2 Casella Acoustical Calibrator Class 2L Instructions

8.3 BNL SBMS Subject Area Noise & Hearing Conservation.

8.4 OSHA Noise/Hearing Conservation 29 CFR 1910.95.

9.0 Attachments

9.1 Photo of meter and parts

9.2 Theory of Operation

9.3 Short List of Operating Instructions Attachment

9.4 *Job Performance Measure Completion Certificate*

BROOKHAVEN NATIONAL LABORATORY Safety & Health Services Division INDUSTRIAL HYGIENE GROUP Standard Operating Procedure: Field Procedure	NUMBER **IH96520** REVISION **Final Rev 1**
SUBJECT: INSTRUMENT OPERATION: **Casella Model CEL-254** **Digital Impulse Sound Level Meter**	DATE **07-13-04** PAGE **9** OF 13

10.0 Documentation

Document Review Tracking Sheet		
PREPARED BY: *(Signature and date on file)* **J. Peters** **SHSD IH Group** **Date 05/25/04**	**REVIEWED BY:** *(Signature and date on file)* **R. Selvey** **SHSD IH Group Leader** **Date 05/25/04**	**APPROVED BY:** *(Signature and date on file)* **R. Selvey** **SHSD IH Group Leader** **Date 05/26/04**
Filing Code: **IH51SR.04**	**DQAR** **Date**	**Effective Date:** **05/26/04**

Periodic Review Record		
Date of Review	Reviewer Signature and Date	Comments Attached
07/13/04	*(Signature and date on file)* R. Selvey	Added Attachment 9.4. Change in Section 7 on qualification and minor text additions in Section 6.

BROOKHAVEN NATIONAL LABORATORY Safety & Health Services Division INDUSTRIAL HYGIENE GROUP Standard Operating Procedure: Field Procedure	NUMBER **IH96520** REVISION **Final Rev 1**
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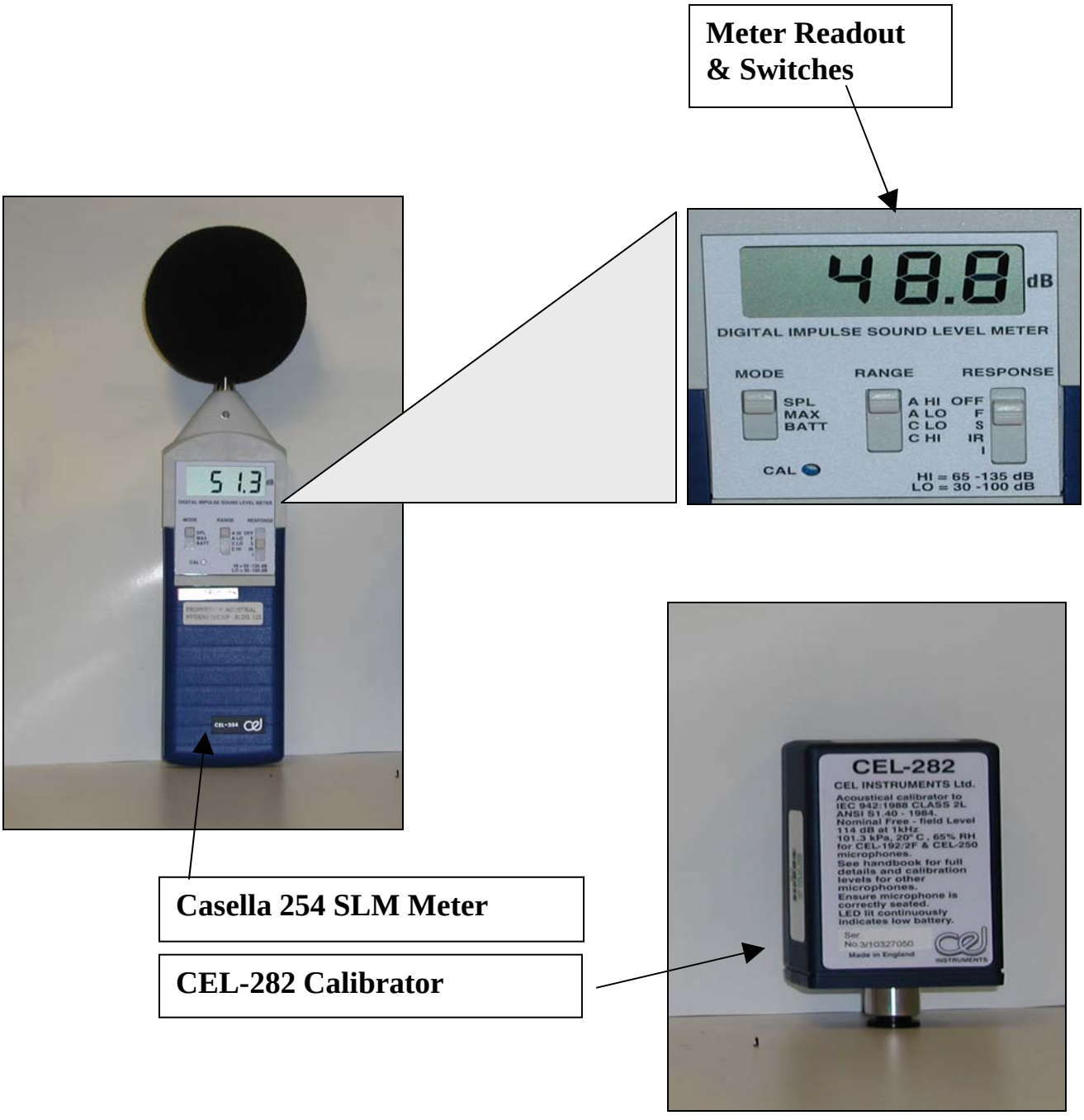
Attachment 9.1
Photo of the Meter and Parts



Attachment 9.2

Theory of Operation

The Casella SLM is a precision sound level meter which incorporates A and C weighting networks, as well as FAST, SLOW, and IMPACT detector response.

- Readings are displayed on the digital readout and are not logged by this instrument.
- The digital display can be used in the continuous mode or it can be operated to capture and hold the maximum level encountered. This is extremely useful when measuring sounds of short duration or vehicle "passerby" sounds.

Weighting Networks. The meter contains two weighting networks, A & C, which shape the noise to discriminate against the frequency components of the measured noise.

- *A Network*: Simulates subjective responses to noise. Generally used in noise surveys to locate noise hazards. The A Network discriminates the low frequencies quite severely. Most regulations require that noise be measured on the A-weighting scale.
- *C Network*: Barely discriminates (filters) against low frequencies.

If measured sound levels of noise are much higher on the C-weighting than on the A- weighting, much of the noise is contributed by the low frequencies.

The meter response time and internal averaging to noise is set with the ***RESPONSE and*** the ***MODE*** settings.

- ***S*** (slow) is normally selected. It is used for slowly varying noise.
- ***F*** (fast) is used for comparatively stable noise.
- ***I*** (Impulse) is used for rapidly varying noise sources.
- ***IR*** (Impulse reset) to clear the display for the next noise measurement.

- ***MAX*** holds and displays the maximum reading. The reading is not stored so returning to ***SPL*** mode erases the previous Max level.
- ***SPL*** displays the current reading and changes at a rate determined by the RESPONSE setting.

Attachment 9.3

Short Operating Instructions

	Step	User Action
1	**Power On**	Slide response switch to **F** (fast) or **S** (slow) response time.
2	**Battery Check**	If batteries are low **LO BAT** appears on the screen. Replace with 4 AAA alkaline batteries.
3	**Calibration**	Set the instrument to read sound pressure level **SPL; A HI; & F:** this is the high A weighting range, and fast response. Place the microphone into the calibrator coupler Turn the calibrator on, read the meter and adjust using the calibration control screw, as necessary, to read 113.6 dBA. Record on the field sheet. Turn off the calibrator; remove the microphone and replace the windscreen.
4	**Set the meter response:**	For typical survey work: • set the Mode to **SPL** (sound pressure level) • set the Range to **A HI** (dBA high range) • set response to **S** (slow)
5	**Record Measurements**	Point the meter at the noise source and collect readings at various points as required by the type of survey to be conducted.
6	**Post-calibration**	Repeat calibrations and record on field sheet.

Noise and Hearing Conservation
Operation of the Casella CEL-254 SPL Meter

Job Performance Measure (JPM) Completion Certificate

Candidate's Name	Life Number:

Practical Skill Evaluation: Demonstration of Evaluation Methodology by Oral Exam

Criteria	Qualifying Performance Standard	Unsat.	Recov.	Satisf.
1. Hazard Analysis	Understands the need to perform a hazard analysis of the area and potential exposure to the self as sampler and workers in the area.			
2. Personal Protective Equipment	Understands the need to be aware of the potential surface contamination, airborne levels of contaminants, radiological hazards, and noise hazard. Knows how to determine the need for PPE.			
3. Sampling Equipment	Knows where equipment needed for the procedure is located and how to properly sign it out.			
6. Operating Parameters	Knows the theory to establish operating parameters (safety envelope) for the equipment.			
7. Documentation	Demonstrates correctly filling out IH monitoring forms.			

IH Noise Meter Operation - Practical Skill Evaluation: Demonstration of Methodology

Criteria	Qualifying Performance Standard	Unsat.	Recov.	Satisf.
1. Turning the Meter On and Off	Demonstrates correctly activating the meter and turning it off			
2. Calibration of the Meter	Demonstrates correctly calibrating/bump checking the meter			
3. Clearing Stored data	Demonstrates the correctly to erase stored data			
4. Operation of taking a reading	Demonstrates correctly hold the meter, and the correct settings			
5. Downloading stored data	Demonstrates correctly extracting stored data from the meter to paper printout and electronic storage.			
6. Clearing data after downloading	Demonstrates correctly for removing stored data for the next user.			

I accept the responsibility for performing this task as demonstrated within this JPM and the corresponding SOP.

Candidate Signature:	Date:

I certify the candidate has satisfactorily performed each of the above listed steps and is capable of performing the task unsupervised.

Evaluator Signature:	Date: